ISO TC184/SC4/WG10_ N235___ Date: 1999-01-13

Supersedes ISO TC 184/SC4/WG__ N____

Product data representation and exchange: Application module: Appearance Assignment

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ABSTRACT:

This document is a draft of the proposed application module which provides mechanisms for the assignment of visual attributes to shape models, geometric elements and annotation.

KEYWORDS:
Application module, appearance assignment, styled element, visual attributes.

COMMENTS TO READER:

This is a sample module for the WG10 STEP Modularization PWI.

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1997-04

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

International Standard ISO 10303-224 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data*.

ISO 10303 consist of the following parts under the general title *Industrial automation systems and integration — Product data representation and exchange*:

— Part 1, Overview and fundamental principles;

— Part 11, Description methods: The EXPRESS language reference manual;

— Part 12, Description method: The EXPRESS-I language reference manual;

— Part 21, Implementation methods: Clear text encoding of the exchange structure;

— Part 22, Implementation method: Standard data access interface specification;

— Part 23, Implementation method: C++ language binding to the standard data access interface;

— Part 24, Implementation method: C language binding to the standard data access interface;

— Part 26, Implementation method: Interface definition language binding to the standard data access;

— Part 31, Conformance testing methodology and framework: General concepts;

— Part 32, Conformance testing methodology and framework: Requirements on testing laboratories and clients;

— Part 34, Conformance testing methodology and framework: Abstract test methods;

— Part 35, Conformance testing methodology and framework: Abstract test methods for SDAI implementations;

— Part 41, Integrated generic resources: Fundamentals of product description and support;

— Part 42, Integrated generic resources: Geometric and topological representation;

— Part 43, Integrated generic resources: Representation structures;

— Part 44, Integrated generic resources: Product structure configuration;

— Part 45, Integrated generic resource: Materials;

— Part 46, Integrated generic resources: Visual presentation;

— Part 47, Integrated generic resource: Shape variation tolerances;

— Part 49, Integrated generic resource: Process structure and properties;

— Part 101, Integrated application resource: Draughting;

— Part 104, Integrated application resource: Finite element analysis;

— Part 105, Integrated application resource: Kinematics;

— Part 106, Integrated application resource: Building construction core model;

— Part 201, Application protocol: Explicit draughting;

— Part 202, Application protocol: Associative draughting;

— Part 203, Application protocol: Configuration controlled design;

— Part 204, Application protocol: Mechanical design using boundary representation;

— Part 205, Application protocol: Mechanical design using surface representation;

— Part 207, Application protocol: Sheet metal die planning and design;

— Part 208, Application protocol: Life cycle management - Change process;

— Part 209, Application protocol: Composite and metallic structural analysis and related design;

— Part 210, Application protocol: Electronic assembly, interconnet, and packaging design;

— Part 212, Application protocol: Electrotechnical design and installation

— Part 213, Application protocol: Numerical control process plans for machined parts;

— Part 214, Application protocol: Core data for automotive mechanical design processes;

— Part 215, Application protocol: Ship arrangement;

— Part 216, Application protocol: Ship moulded forms;

— Part 217, Application protocol: Ship piping;

— Part 218, Application protocol: Ship structures;

— Part 221, Application protocol: Functional data and their schematic representation for process plant;

— Part 222, Application protocol: Exchange of product data for composite structures;

— Part 223, Application protocol: Exchange of design and manufacturing product information for casting parts;

— Part 224, Application protocol: Mechanical product definition for process plans using machining features;

— Part 225, Application protocol: Building elements using explicit shape representation;

— Part 226, Application protocol: Ship mechanical systems;

— Part 227, Application protocol: Plant spatial configuration;

— Part 229, Application protocol: Exchange of design and manufacturing product information for forged parts;

— Part 230, Application protocol: Building structural frame: Steelwork;

— Part 231, Application protocol: Process engineering data: Process design and process specification of major equipment;

— Part 232, Application protocol: Technical data packaging core information and exchange;

— Part 301, Abstract test suite: Explicit draughting;

— Part 302, Abstract test suite: Associative draughting;

— Part 303, Abstract test suite: Configuration controlled design;

— Part 304, Abstract test suite: Mechanical design using boundary representation;

— Part 305, Abstract test suite: Mechanical design using surface representation;

— Part 307, Abstract test suite: Sheet metal die planning and design;

— Part 308, Abstract test suite: Life cycle management - Change process;

— Part 309, Abstract test suite: Composite and metallic structural analysis and related design;

— Part 310, Abstract test suite: Electronic assembly, interconnect, and packaging design;

— Part 312, Abstract test suite: Electrotechnical design and installation;

— Part 313, Abstract test suite: Numerical control process plans for machined parts;

— Part 314, Abstract test suite: Core data for automotive mechanical design processes;

— Part 315, Abstract test suite: Ship arrangement;

— Part 316, Abstract test suite: Ship moulded forms;

— Part 317, Abstract test suite: Ship piping;

— Part 318, Abstract test suite: Ship structures;

— Part 321, Abstract test suite: Functional data and their schematic representation for process plant;

— Part 322, Abstract test suite: Exchange of product data for composite structures;

— Part 323, Abstract test suite: Exchange of design and manufacturing product information for casting parts;

— Part 324, Abstract test suite: Mechanical product definition for process plans using machining features;

— Part 325, Abstract test suite: Building elements using explicit shape representation;

— Part 326, Abstract test suite: Ship mechanical systems;

— Part 327, Abstract test suite: Plant spatial configuration;

— Part 329, Abstract test suite: Exchange of design and manufacturing product information for forged parts;

— Part 330, Abstract test suite: Building structural frame: Steelwork;

— Part 331, Abstract test suite: Process engineering data: Process design and process specification of major equipment;

— Part 332, Abstract test suite: Technical data packaging core information and exchange;

— Part 501, Application interpreted construct: Edge-based wireframe;

— Part 502, Application interpreted construct: Shell-based wireframe;

— Part 503, Application interpreted construct: Geometrically bounded 2D wireframe;

— Part 504, Application interpreted construct: Draughting annotation;

— Part 505, Application interpreted construct: Drawing structure and administration;

— Part 506, Application interpreted construct: Draughting elements;

— Part 507, Application interpreted construct: Geometrically bounded surface;

— Part 508, Application interpreted construct: Non-manifold surface;

— Part 509, Application interpreted construct: Manifold surface;

— Part 510, Application interpreted construct: Geometrically bounded wireframe;

— Part 511, Application interpreted construct: Topologically bounded surface;

— Part 512, Application interpreted construct: Faceted boundary representation;

— Part 513, Application interpreted construct: Elementary boundary representation;

— Part 514, Application interpreted construct: Advanced boundary representation;

— Part 515, Application interpreted construct: Constructive solid geometry;

— Part 517, Application interpreted construct: Mechanical design geometric presentation;

— Part 518, Application interpreted construct: Mechanical design shaded presentation.

The structure of this International Standard is described in ISO 10303-1. The numbering of the parts of the International Standard reflects its structure:

— Parts 11 to 12 specify the description methods,

— Parts 21 to 26 specify the implementation methods,

— Parts 31 to 35 specify the conformance testing methodology and framework,

— Parts 41 to 49 specify the integrated generic resources,

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— Parts 101 to 106 specify the integrated application resources,

— Parts 201 to 232 specify the application protocols,

— Parts 301 to 332 specify the abstract test suites, and

— Parts 501 to 518 specify the application interpreted constructs.

Should further parts be published, they will follow the same numbering pattern.

Annex A, B, C, D, and E form an integral part of this part of ISO 10303. Annexes F, G, H, J, and K are for information only.

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation and exchange of product data. The objective is to provide a neutral mechanism capable of describing product data throughout the life cycle of a product, independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving.

This International Standard is organized as a series of parts, each published separately. The parts of ISO 10303 fall into one of the following series: description methods, integrated resources, application interpreted constructs, application protocols, application modules, abstract test suites, implementation methods, and conformance testing. The series are described in ISO 10303-1. This part of ISO 10303 is a member of the application module series.

This part of ISO 10303 specifies an application module for assignment of visual attributes to shape models, geometric elements and annotation.

INTERNATIONAL STANDARD ISO   ISO/PWI 10303-6XX

Industrial automation systems and integration — Product data representation and exchange — Part 6xx: Application module: Appearance Assignment

1 Scope

This part of ISO 10303 specifies the application module for the assignment of visual attributes to shape models, geometric elements and annotation.

The following are within scope of this part of ISO 10303:

— The association of visual attributes with shape models, geometric elements and annotation.

The following are outside the scope of this part of ISO 10303:

— The definition of views on which shape models, geometric elements or annotation are presented.

— The specification of shape models.

— The specification of visual attributes.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 8824-1:1994, *Information technology — Open systems interconnection — Abstract syntax notation one (ASN.1) — Part 1: Specification of basic notation.*

ISO 10303-1:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles.*

ISO 10303-11:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual.*

ISO/CD 10303-41[1], *Industrial automation systems and integration — Product data representation and exchange — Part 41: Integrated generic resource: Fundamentals of product description and support.*

ISO 10303-46, *Industrial automation systems and integration — Product data representation and exchange — Part 46, Integrated generic resources: Visual presentation*

3 Terms, definitions, and abbreviations

3.1 Terms defined in ISO 1101

For the purpose of this part of ISO 10303, the following terms defined in ISO 1101 apply.

— application;

— application protocol;

— data;

— information;

— integrated resource;

— product;

— product data.

4 Information requirements

This clause specifies the information requirements for the appearance assignment module.
The information requirements are specified as a set of units of functionality, application elements, and application assertions. These assertions pertain to individual application entities and to relationships between application entities. The information requirements are defined using the terminology of the subject area of this application module.

— A graphical representation of the information requirements is given in annex C.

— The mapping table is specified in 5.1 which shows how the information requirements are met using the integrated resources of this International Standard. The use of the integrated resources introduces additional requirements which are common to application modules and protocols.

EXPRESS specification:

*)

---

[1] To be published.

```
SCHEMA appearance_assignment_arm;
(*
```

4.1 Units of Functionality

This subclause specifies the units of functionality (UoF) for the appearance assignment application module as well as any support elements needed for the module definition. This part of ISO 10303 specifies the following units of functionality:

> — Appearance assignment.

This part of ISO 10303 uses the following units of functionality.

> — Elemental shape.

The units of functionality and a description of the functions that each UoF supports are given below. The module entities included in the UoFs are defined in clause 4.3.

4.1.1 Appearance assignment

The appearance assignment UoF specifies information for assignment of visual attributes to shape models, geometric elements and annotation
The following application entities are specified in the appearance assignment UoF:

> — Appearance_assignment;
>
> — Context_dependent_appearance_assignment;
>
> — Overriding_styled_element;
>
> — Styled_element;
>
> — Styled_geometric_model;
>
> — Styled_model;
>
> — Styled_model_element.

4.1.2 Elemental shape

This UoF is specified in the elemental_shape module. The following application entities from this UoF are referenced in the appearance assignment module:

> — Detailed_element;
>
> — Detailed_model_element;
>
> — Geometric_model;

— Template_instance.

4.2 Referenced AM ARMs

The following EXPRESS reference statements specify the elements imported from the ARMs of other modules.

EXPRESS specification:

```
*)
USE FROM elemental_shape_arm;
(*
```

4.3 ARM type definitions

This subclause specifies the application types for the appearance assignment module. The application types and their definitions are given below.

4.3.1 Appearance_context_select

An appearance_context_select indicates possible contexts for the assignment of overriding visual attributes. The contexts shall be specified by a module that uses the appearance assignment module.

EXPRESS specification:

```
*)
TYPE appearance_context_select = SELECT
    ( );
END_TYPE;
(*
```

4.3.2 Appearance_select

An appearance_select indicates the styles of visual attributes that can be assigned to shape models, geometric elements and annotation. The styles shall be specified by a module that uses the appearance assignment module.

EXPRESS specification:

```
*)
TYPE appearance_select = SELECT
    ( );
END_TYPE;
(*
```

4.4 ARM entity definitions

This subclause specifies the application entities for the appearance assignment module. Each application entity is an atomic element that embodies a unique application concept and contains attributes specifying the data elements of the entity. The application entities and their definitions are given below.

4.4.1 Appearance_assignment

An appearance_assignment governs the visual appearance of geometric elements and annotation. The appearance can be defined explicitly for each represented element or for a context in which the elements are represented. Several appearance components for the representation of the different kinds of elements can be associated with the appearance_assignment.

EXPRESS specification:

```
*)
ENTITY appearance_assignment;
      component: SET [1:?] OF appearance_select;
END_ENTITY;
(*
```

Attribute definitions:

component: specifies the various appearance components to define the appearance of geometric and annotation objects.

4.4.2 Context_dependent_appearance_assignment

A Context_dependent_apperance_assignment is the appearance of geometric elements and annotation with regard to a context in which these elements are represented. The context_dependent_appearance_ assignment is overridden by appearances associated with elements by an appearance_assignment. A context_dependent_appearance_-assignment is a type of appearance_assignment.

EXPRESS specification:

```
*)
ENTITY context_dependent_appearance_assignment
SUBTYPE OF (appearance_assignment);
      appearance_context: appearance_context_select;
END_ENTITY;
(*
```

Attribute definitions:

appearance_context: specifies the context where the appearance components are valid.

4.4.3 Overriding_styled_element

An overriding_styled_element supports the assignment of visual attributes to an element so that these attributes take precedence over other assigned styles.

<u>EXPRESS specification:</u>

```
*)
ENTITY overriding_styled_element
      SUBTYPE OF (styled_element);
      is_defined_for: SET [1:?] OF appearance_context_select;
END_ENTITY;
(*
```

<u>Attribute definitions:</u>

is_defined_for: specifies the contexts to which the style assignment applies..

4.4.4 Styled_element

A Styled_element is a Detailed_element that has presentation information.

<u>EXPRESS specification:</u>

```
*)
ENTITY styled_element
    SUBTYPE OF (detailed_element);
      appearance: appearance_assignment;
      invisible: BOOLEAN;
END_ENTITY;
(*
```

<u>Attribute definitions:</u>

appearance: specifies the associated presentation information.

invisible: specifies if the Styled_element is invisible.

4.4.5 Styled_geometric_model

A Styled_geometric_model is a set of geometric elements that have presentation information.

<u>EXPRESS specification:</u>

```
*)
ENTITY styled_geometric_model
  SUBTYPE OF (styled_model);
```

```
     styled_geometry: geometric_model;
END_ENTITY;
(*
```

Attribute definitions:

styled_geometry: specifies the Geometric_model that contains the Styled_geometric_elements.

4.4.6 Styled_model

A Styled_model is a set of geometric or annotation elements that have presentation information.

EXPRESS specification:

```
*)
ENTITY styled_model;
      additional_elements: SET [0:?] OF template_instance;
      description: OPTIONAL STRING;
      element: SET [1:?] OF styled_element;
      model_id: STRING;
END_ENTITY;
(*
```

Attribute definitions:

additional_elements: specifies the Template_instance objects that are additionally imported into the Styled_model. The Additional_elements shall also be of type Styled_model.

description: specifies additional information about the Styled_model

element: specifies the set of Styled_element objects that forms the Styled_model.

model_id: specifies the identifier of the Styled_model.

4.4.7 Styled_model_element

A Styled_model_element is a Styled_element that represents geometry.

EXPRESS specification:

```
*)
ENTITY styled_model_element
  SUBTYPE OF (styled_element);
element: detailed_model_element;
END_ENTITY;
(*
```

Attribute definitions:

element: specifies the Detailed_model_element that is attached to the presentation information.

```
*)
END_SCHEMA;
(*
```

5 Module Interpreted Model

5.1 Mapping Table

This clause contains the mapping table that shows how each UoF and application entity of this part of ISO 10303 (see 4) maps to one or several MIM resource constructs. The mapping table is organized in five columns. The contents of these five columns are:

Column 1) Application element: Name of an application element as it appears in the application entity definition. Application entity names are written in uppercase. Attribute names are listed after the application entity to which they belong and are written in lower case.

Column 2) MIM element: Name of an MIM element as it appears in the MIM, the term 'IDENTICAL MAPPING', or the term 'PATH'. MIM entities are written in lower case. Attribute names of MIM entities are referred to as <entity name>.<attribute name>. The mapping of an application element may result in several related MIM elements. Each of these MIM elements will require a line of its own in the table. The term 'IDENTICAL MAPPING' indicates that both application entities of an application assertion map to the same MIM element. The term 'PATH' indicates that the application assertion maps to the entire reference path.

Column 3) Source: For those MIM elements that are interpreted from the integrated resources, this is the number of the corresponding part of ISO 10303. For those MIM elements that are created for the purpose of this part of ISO 10303, this is the number of this part.

Column 4) Rules: One or more numbers may be given which refer to rules that apply to the current MIM element or reference path. For rules that are derived from relationships between application entities, the same rule is referred to by the mapping entries of all the involved MIM elements. The expanded names of the rules are listed after the table.

Column 5) Reference path: To describe fully the mapping of an application entity, it may be necessary to specify a reference path through several related MIM elements. The reference path column documents the role of a MIM element relative to the MIM element in the row succeeding it. Two or more such related MIM elements define the interpretation of the integrated resources that satisfies the requirement specified by the application entity. For each MIM element that has been created for use within this part of ISO 10303, a reference path up to its supertype from an integrated resource is specified.

For the expression of reference paths and the relationships between MIM elements, the following notational conventions apply:

a) [] : multiple MIM elements or sections of the reference path are required to satisfy an information requirement;

b) () : multiple MIM elements or sections of the reference path are identified as alternatives within the mapping to satisfy an information requirement;

c) {} : enclosed section constrains the reference path to satisfy an information requirement;

d) -> : attribute references the entity or select type given in the following row;

e) <- : entity or select type is referenced by the attribute in the following row;

f) [i] : attribute is an aggregation of which a single member is given in the following row;

g) [n] : attribute is an aggregation of which member n is given in the following row;

h) => : entity is a supertype of the entity given in the following row;

i) <= : entity is a subtype of the entity given in the following row;

j) = : the string, select or enumeration type is constrained to a choice or value;

k) \ : the line continuation for strings that wrap.

Table 1 - Mapping table for Appearance Assignment UoF

Application element	AIM element	Source	Rules	Reference path
APPEARANCE_ ASSIGNMENT	presentation_style_ assignment	46		
component	PATH			presentation_style_assignment presentation_style_assignment.styles[i]-> presentation_style_select
CONTEXT_DEPENDENT_ - APPEARANCE_ ASSIGNMENT	presentation_style_by_ context	46		
apperance_context	PATH			presentation_style_by_context presentaton_style_by_context.style_context style_context_select
OVERRIDING_STYLED_ ELEMENT	context_dependent_overri ding_styled_item	46		
is_defined_for	PATH			context_dependent_over_riding_styled_item <= over_riding_styled_item <= styled_item styled_item.item -> representation_item
STYLED_ELEMENT	styled_item	46		
appearance	PATH			styled_item styled_item.styles[i]-> presentation_style_assignment
invisible	invisibility.invisible_item s	46		styled_item invisible_item=styled_item invisible_item<- invisibility.invisible_items[i]
STYLED_GEOMETRIC_ MODEL	(mechanical_design_ geometric_presentation_ representation) (representation)	6xx 43		(mechanical_design_ geometric_presentation_ representation<=) (representation)
styled_geometry	PATH			(mechanical_design_ geometric_presentation_ representation<=)

Application element	AIM element	Source	Rules	Reference path
				representation representation.items[i]-> representation_item=> mapped_item mapped_item.mapping_source-> representation_map representation_map.mapped_representation-> representation=> shape_representation
STYLED_MODEL	(mechanical_design_ geometric_presentation_ representation) (representation)	6xx 43		(mechanical_design_geometric_presentation_representation<=) (representation)
additional_elements	PATH			(mechanical_design_geometric_presentation_representation <= representation representation_items[i]-> representation_item=> mapped_item {mapped_item.mapping_source-> representation_map representation_map.mapped_representation-> representation=> mechanical_design_geometric_presentation_representation})
description	representation_ description.description	43		(mechanical_design_geometric_presentation_ representation<=) representation representation.description[1]-> representation_description representation_description.description
elements	PATH			(mechanical_design_geometric_presentation_ representation<=) representation representation.items[i]-> representation_item=> styled_item
model_id	representation_identifier. id	43		(mechanical_design_geometric_presentation_ representation<=) representation representation.id[1]-> representation_identifier

Application element	AIM element	Source	Rules	Reference path
				representation_identifier.identifier
STYLED_MODEL_ELEMENT	styled_item	46		
element	PATH			styled_item styled_item.item-> representation_item

5.2 Module EXPRESS short listing

This clause specifies the EXPRESS schema that uses elements from the integrated resources or application interpreted constructs and contains the types, entity specializations, rules, and functions that are specific to this part of ISO 10303. This clause also specifies modifications to the textual material for constructs that are imported from the integrated resources. The definitions and EXPRESS provided in the integrated resources or application interpreted constructs for constructs used in the MIM may include select list items and subtypes which are not imported into the MIM. Requirements stated in the integrated resources or application interpreted constructs which refer to such items and subtypes apply exclusively to those items which are imported into the MIM.

EXPRESS Specification:

```
*)
SCHEMA appearance_assignment_mim;

USE FROM elemental_shape_mim;

USE FROM presentation_appearance_schema
( context_dependent_over_riding_styled_item,
  invisibility,
  presentation_style_by_context);

(*
```

NOTE 1 - See annex D for a graphical presentation of this schema using the EXPRESS-G notation.

NOTE 2 - The schemas referenced above can be found in the following part of ISO 10303:

    presentation_apperance_schema   ISO 10303-46

    representation_schema   ISO 10303-43

5.2.1 Module entity definitions

This subclause contains the EXPRESS entity definitions in the module.

5.2.1.1 Mechanical_design_geometric_presentation_representation

A **mechanical_design_geometric_presentation_representation** specifies the shape that shall be viewed in a presentation area. The entity is a subtype of representation.

EXPRESS specification:

```
*)
```

```
ENTITY mechanical_design_geometric_presentation_representation
      SUBTYPE OF (representation);
END_ENTITY;
(*

*)
END_SCHEMA;
(*
```

Annex A
(normative)

MIM short names of entities

Table A.1 provides the short names of entities specified in this part of ISO 10303. Requirements on the use of the short names are found in the implementation methods included in ISO 10303.

Table A.1 - MIM short names of entities

Entity Names	Short Names

Annex B
(normative)

Information object registration

B.1 Document identification

To provide for unambiguous identification of an information object in an open system, the object identifier

{ iso standard 10303 part(6xx) version(0) }

is assigned to this part of ISO 10303. The meaning of this value is defined in ISO/IEC 8824-1, and is described in ISO 10303-1.

B.2 Schema identification

To provide for unambiguous identification of the schema specification given in this application module colour-schema in an open information system, the object identifiers are assigned as follows:

{ iso standard 10303 part(6xx) version(0) object(1) appearance_assignment_mim-schema(1) }

is assigned to the appearance_assignment_mim schema.

{ iso standard 10303 part(6xx) version(0) object(1) appearance_assignment_mim-schema(2) }

is assigned to the appearance_assignment_mim schema short form schema (see 5.2).
The meaning of this value is defined in ISO 8824-1, and is described in ISO 10303-1.

Annex C
(informative)

ARM EXPRESS-G

Figure C.1 - ARM diagram 1 of 2
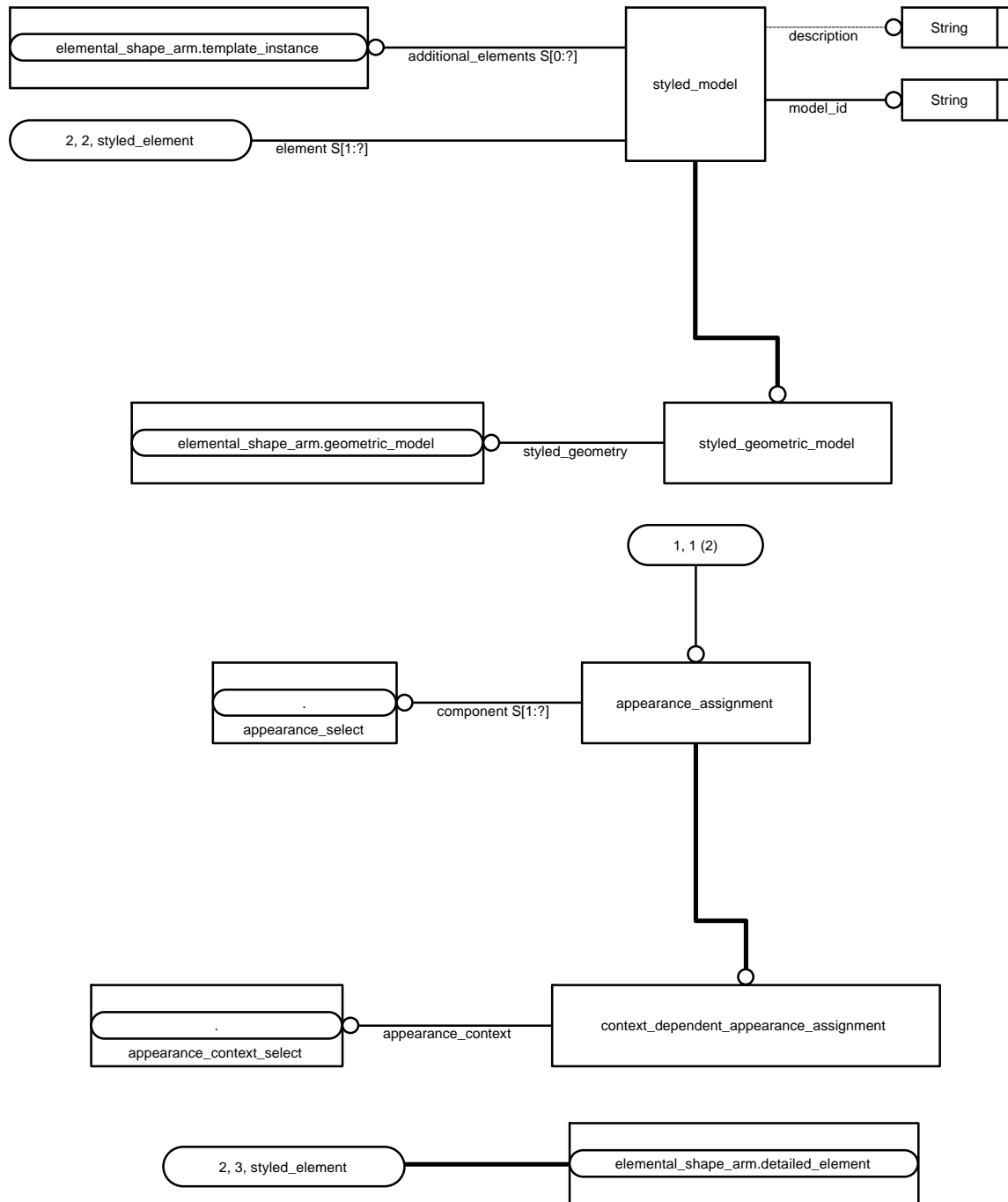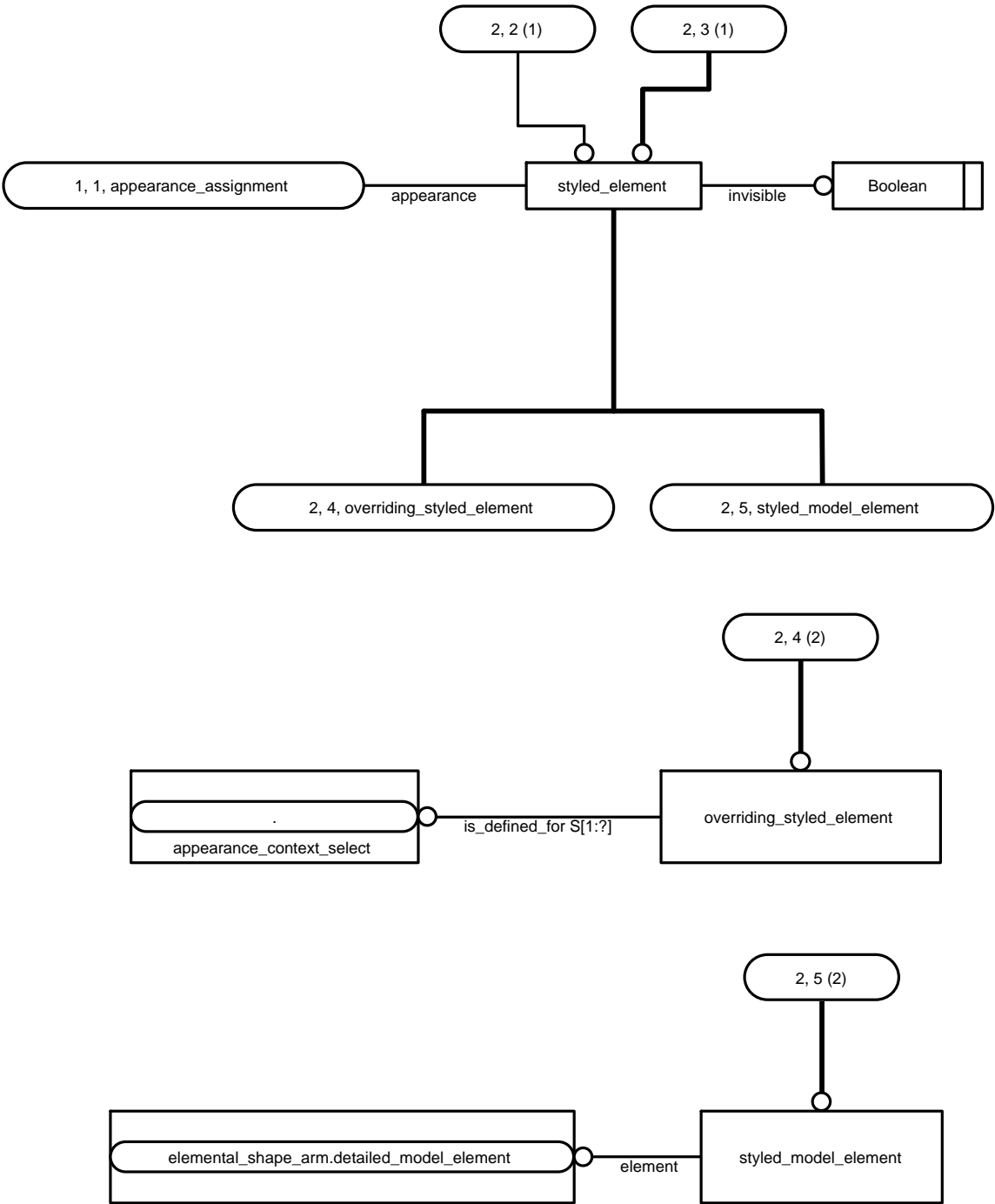
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Figure C.2 - ARM diagram 2 of 2

Annex D
(informative)

MIM EXPRESS-G

The following diagrams correspond to the MIM EXPRESS expanded listing given in Annex E. The diagrams use the EXPRESS-G graphical notation for the EXPRESS language. EXPRESS-G is defined in annex A of ISO 10303-11. Note that the inter-page referencing is to the diagram number and not the figure number.

1, 3 (1, 2)

4, 2, label —name— representation_item

1, 4 (4, 1)

4, 1, presentation_style_assignment —styles S[1:?]— styled_item —item— 1, 3, representation_item

1, 4, styled_item —over_ridden_style— over_riding_styled_item

style_context_select —style_context S[1:2]— context_dependent_over_riding_styled_item
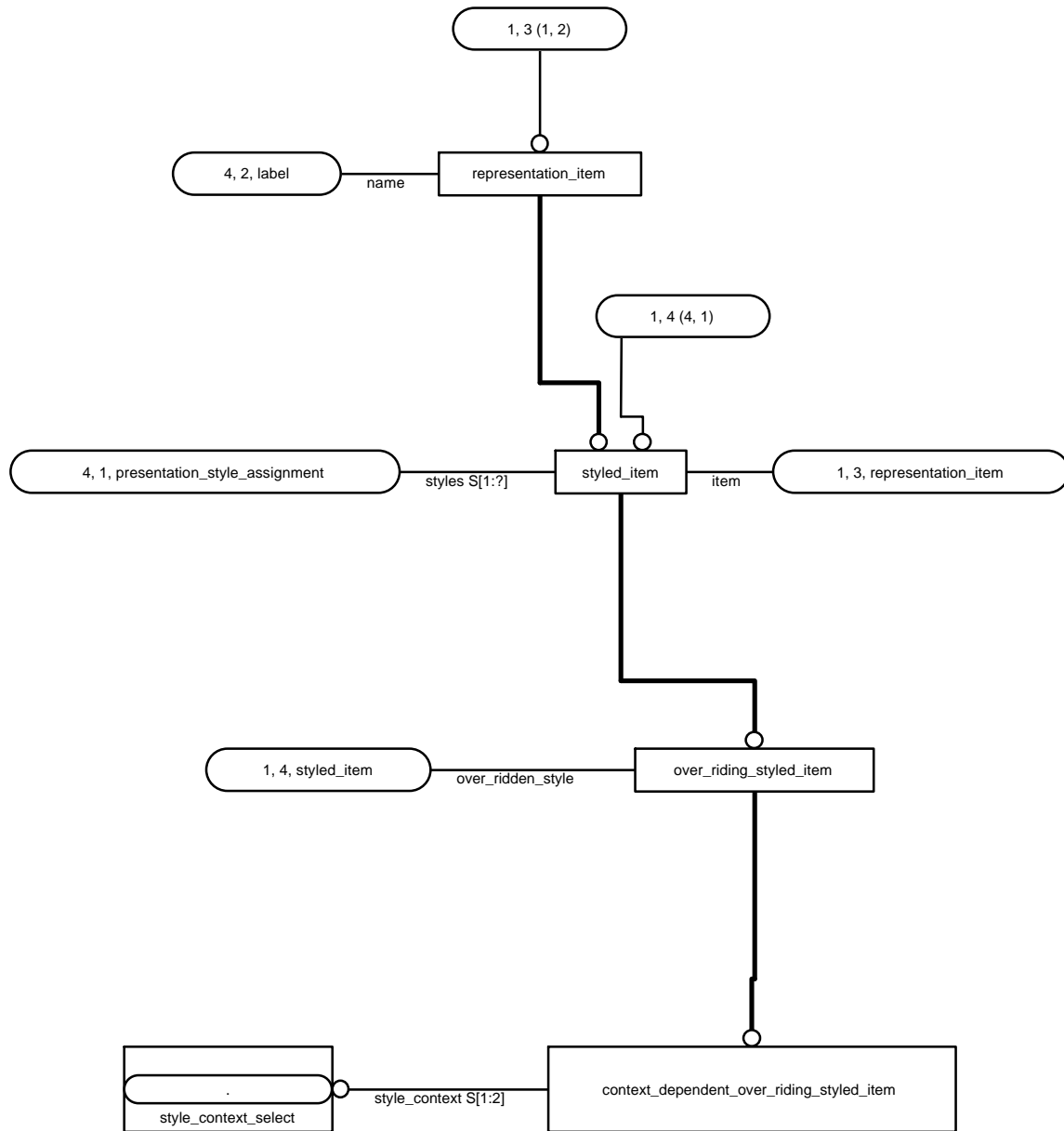
Figure D.1 - MIM EXPRESS -G diagram 1 of 3

```
                              ┌──────────────────┐
                              │   2, 8 (2, 2, 4) │
                              └──────────────────┘
                                       │
┌──────────────────┐                   │             items S[1:?]    ┌──────────────────────────┐
│    4, 2, label   │────── name ───────┤───────────────────────────── │  1, 3, representation_item│
└──────────────────┘            ┌──────┴───────┐                      └──────────────────────────┘
┌──────────────────────────┐    │              │                      ┌──────────────────────────────┐
│ 2, 9, representation_context│─ context_of_items│ representation │─ (INV)id S[0:1] ─│ 2, 10, representation_identifier│
└──────────────────────────┘    │              │                      └──────────────────────────────┘
┌────────────────────────────────┐  │          │
│ 4, 11, representation_description│─(INV)description S[0:1]─│
└────────────────────────────────┘  └───────┬──────┘
                                            │
                                            │
                          ┌─────────────────┴──────────────────────────────────────┐
                          │ mechanical_design_geometric_presentation_representation │
                          └────────────────────────────────────────────────────────┘
```

```
                                    ┌──────────────┐
                                    │   2, 9 (2)   │
                                    └──────────────┘
                                           │
┌──────────────────┐                ┌──────┴──────────────┐
│  4, 6, identifier│─ context_identifier │                     │─ context_type ─┤ 4, 7, text │
└──────────────────┘                │ representation_context│                  └────────────┘
┌────────────────────────┐          │                     │
│ 2, 8, representation    │─(INV)representations_in_context S[1:?]─│
└────────────────────────┘          └─────────────────────┘
```

```
┌──────────────────────┐                            ┌──────────────┐
│ 4, 5, invisible_item │─ invisible_items S[1:?] ───│ invisibility │
└──────────────────────┘                            └──────────────┘
```

```
                              ┌──────────────┐
                              │   2, 10 (2)  │
                              └──────────────┘
                                     │
┌──────────────────┐          ┌──────┴──────────────────┐                                  ┌──────────────────────┐
│  4, 6, identifier│─── id ───│ representation_identifier│─ identified_representation ──────│ 2, 8, representation │
└──────────────────┘          └─────────────────────────┘                                  └──────────────────────┘
```
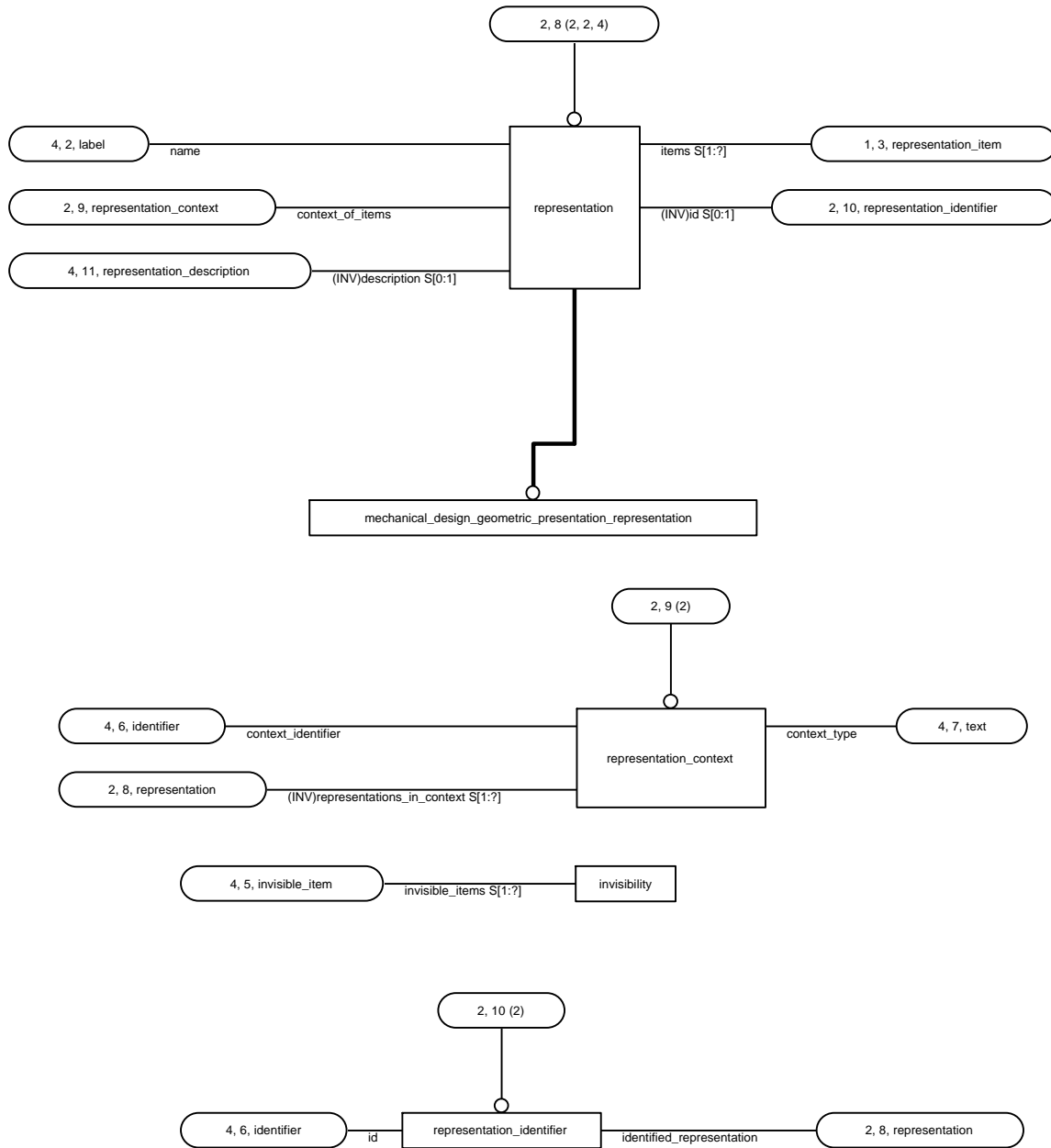
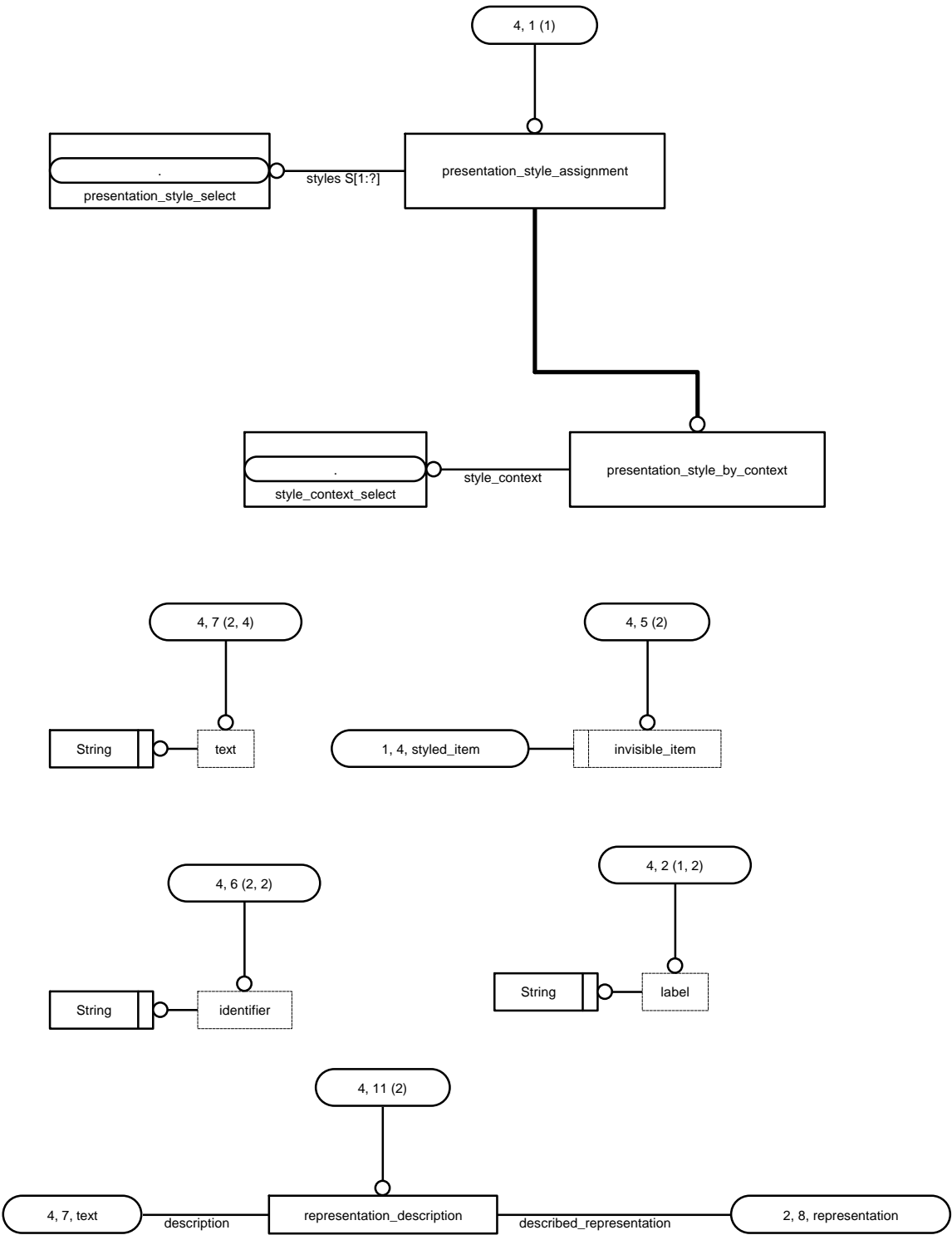**Figure D.2- MIM EXPRESS -G diagram 2 of 3**

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Figure D.3 - MIM EXPRESS -G diagram 3 of 3

Annex E
(informative)

AM ARM and MIM EXPRESS

This annex provides a listing of the EXPRESS for the ARM specified in clause 4 and expanded EXPRESS schema specified in clause 5.2 of this part of ISO 10303 without comments or other explanatory text. It also provides a listing of the EXPRESS entity names and corresponding short names as specified in annex B of this part of ISO 10303. The content of this annex is available in computer-interpretable form and can be found at the following URLs:

Annex F
(informative)

Application module implementation and usage guide

Annex G
(informative)

Technical Discussions

Annex H
(informative)

Bibliography

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